Scientific and Technical Decision-Making in the National Flood Insurance Program of the Federal Insurance Administration

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Administrative Conference of the United States
Washington, D.C. 20037

SCIENTIFIC AND TECHNICAL DECISION-MAKING IN THE NATIONAL FLOOD INSURANCE PROGRAM OF THE FEDERAL INSURANCE ADMINISTRATION

by

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September 1977

Administrative Conference of the United States
2120 L Street, N. W.
Washington, D. C. 20037

Preface

This report was prepared in the Office of the Chairman of the Administrative Conference of the United States. It is the first in a proposed series of reports intended to survey Federal agency functions whose performance depends significantly on the determination of scientific or technical questions. The authors have sought to identify the procedures followed by the Federal Insurance Administration of the Department of Housing and Urban Development in performing such functions. Thus no attempt was made to examine issues not clearly related to the procedures utilized in obtaining and evaluating technical information.

The study was based on a review of the legal literature -- including statutes and regulations, Congressional hearings, agency reports, and articles in professional journals -- followed by personal interviews with appropriate persons, both within and outside the Federal Insurance Administration. No attempt was made to interview local government officials, insurance industry personnel, or affected property owners. A draft of the report was circulated to the individuals interviewed, as well as other interested persons. Comments received were taken into consideration in the preparation of the final version of the report. Of course, any errors are the responsibility of the individual authors. The report has not been reviewed by the membership of the Administrative Conference.

The authors wish especially to thank the personnel of the Federal Insurance Administration who assisted them in the preparation of the report.

SCIENTIFIC AND TECHNICAL DECISION-MAKING IN THE NATIONAL FLOOD INSURANCE PROGRAM OF THE FEDERAL INSURANCE ADMINISTRATION

A. The National Flood Insurance Program[1]

The Federal Insurance Administration (FIA) is an agency of the Department of Housing and Urban Development (HUD). FIA administers three Federal insurance programs: the National Flood Insurance Program (NFIP), the Riot Reinsurance Program, and the Crime Insurance Program. Administration of the NFIP involves certain scientific and technical determinations. The NFIP has two basic purposes: to provide flood insurance at a subsidized rate to property owners in flood prone areas, and to induce local communities to adopt flood control plans and comprehensive zoning restrictions on construction in the flood plain in order to minimize flood damage to any buildings constructed in the future.[2] The long range goals of the program are to reduce Federal disaster relief expenditures and the need for flood control projects.

The determination that a particular geographical area is flood prone (i.e., that it is a flood plain) makes the property owners in that area eligible to purchase subsidized flood insurance. This determination is made by the FIA through the procedure described in section B(4) of this report. The actual selling and servicing of the flood insurance policies is handled by those private insurance companies that are members of the National Flood Insurers Association.[3] The National Flood Insurers Association is composed of a pool of private insurance companies that have applied to FIA to participate in the NFIP. Each company must meet certain financial requirements and agree to be the agent of the FIA in the sale of the insurance policies.[4] The Federal government participates by making payments to the pool of insurance companies based on the difference between the actuarial rate and the rate paid by the property owner. The FIA in calculating this payment also takes into account cumulative loss experience and long-term trends.[5]

The NFIP provides insurance coverage for all types of buildings, regardless of whether the ownership is private or public, and regardless of the use of the building (commercial, agricultural, residential, etc.). Building contents are also insurable whether or not the structure is insured.[6]

Before the National Flood Insurance Program was instituted, the Federal government's efforts to mitigate losses from flooding involved pre-flood measures, such as flood forecasting and construction of dams and levees, and the post-flood measure of providing Federal disaster relief.[7] HUD's

1966 Flood Insurance Feasibility Study (see note 7 for a description of the study) pointed out the limitations of relying solely on those measures and concluded that the cost of damage from floods was increasing at a faster rate than the population.[8] The study found that the flood protection public works projects had indirectly contributed to the accelerated damage from floods because they provided a false sense of security to people inhabiting flood plains. Development occurred in flood-prone regions due either to overestimation of the amount of protection, misinterpretation of conditions, or blatant disregard of the risks involved.[9] To meet this problem the NFIP requires that in order for a community to participate in the program, it must enact certain minimum restrictions on new construction in the most hazardous areas and must require floodproofing in certain circumstances (see section B(6) for details).[10] These restrictions apply only to new construction and substantial additions to existing structures.[11] A community's local government is free not to participate in the program. However, except for limited provisions which allow Federally-related loans for the purpose of acquiring or improving certain types of structures occupied prior to 1976,[12] all Federally supported financial assistance for construction in the flood prone area, including loans from Federally insured savings and loans, all FHA or VA mortgage insurance, and all grants for construction projects, are withheld if a community chooses not to participate.[13] Even if a community takes the steps necessary to participate in the program, before any Federal money can be used for acquisition or construction of a structure, the individual property owner must have flood insurance.[14]

B. Scientific and Technical Information Gathering

Scientific or technical information is necessary to reach a decision at six points in the operation of the flood insurance program:

> (1) the adoption of the one percent chance flood as the base flood;
>
> (2) the determination of areas of special flood hazard;
>
> (3) the process of updating and improving the methods used to determine the one percent chance flood;
>
> (4) the procedures by which FIA applies the flood determination method to each community;
>
> (5) the handling of technical disputes in the appeal process; and
>
> (6) the process of developing and applying flood plain management criteria.

B(1) The Adoption of the One Percent Chance Flood as the Base Flood

To predict flood damage it is essential to determine the area of land affected and the height to which the water will rise in that area. The higher the water level rises above normal, the greater the area which will be affected. The larger the flood, the less likely it is to occur. Floods are generally described in terms of "exceedance probabilities," i.e., an X percent chance flood at a particular location is a flood of such magnitude (height) that the probability is X percent that there will occur a flood equaling or exceeding that magnitude during a one year period.[15]

The base flood is that level of flooding which is used by FIA to delimit the geographical area of land that would be subject to the building standards and restrictions of the NFIP.[16] This geographical area of land is termed an "area of special flood hazard."[17] For the one percent chance flood, the base flood adopted by FIA, there is one chance in one hundred of that water height being equaled or exceeded in any one year period. The risk of exceeding the one percent chance flood height increases for time periods greater than one year. For example, during a fifty year period there is about a forty percent chance of one or more floods occurring with a water height that exceeds the height of the one percent chance flood.[18] The major disputes in the NFIP have not been generated by the choice of method used to predict the area of special flood hazard, but rather concern the choice of the level of flooding ("base flood") which should be adopted to define the region where flood plain management criteria must be implemented by the local community.[19]

Under the statute, "the term 'flood' shall have such meaning as may be prescribed in the regulations of the Secretary [of HUD]."[20] The NFIP regulations define a base flood as "the flood having a one percent chance of being equaled or exceeded in any given year."[21] The extent of land determined by this definition will vary drastically depending upon the topography of the land at risk. For example, if the land is flat on either side of a river, a large land area will be affected. The Senate Banking, Housing and Urban Affairs Committee Report on the Flood Disaster Protection Act of 1973 stated that FIA's adoption of the one percent chance flood as its standard "is reasonable and consistent with Nationwide standards for flood protection."[22]

The choice of a base flood level is ultimately an economic decision. Although the primary considerations in the decision on what base flood to use are economic, this report will outline how the scientific and technical information inputs to that decision were obtained. Accurate and reliable scientific information is necessary in order to determine when floods occur, their magnitude, their probability, where they occur, and to help estimate the average annual damage from floods.[23] This type of information provides the base line data for an examination of the alternatives available to the government and the probable effects and costs of implementing those alternatives. The basic tools in this technical analysis are the flood determination methods discussed in section B(2).[24]

FIA arrived at the decision to adopt the one percent chance flood as the base flood through a gradual evolutionary process. There was no formal procedure followed. Deputy Federal Insurance Administrator J. Robert Hunter described it as a process of developing a consensus among those government, academic, and private interests who were working in the fields of hydrology, disaster relief, and water resources.[25] The history outlined below was also the basis for FIA's development of its proposed flood plain management criteria and the choice of the flood elevation determination methodology to be used. From interviews with personnel at FIA and review of the reports available, it seems that the major concerns of FIA in this period were over what percent chance flood to adopt as the base flood and, to a lesser degree, what flood plain management criteria to use. The ultimate choice of methodology was based on selection of the best practical engineering method available (see section B(2) for details).[26]

In 1966, before NFIP was created, HUD prepared the flood insurance Feasibility Study in which it considered various options for a flood insurance program.[27] At the same time, the President's Task Force on Federal Flood Control Policy issued a more general study of water resources and management entitled "Unified National Program for Managing Flood Losses."[28] The technical information for the HUD Feasibility Study was obtained from those Federal agencies with expertise in flood hazard work (Army Corps of Engineers, Coast Guard, Geological Survey, Bureau of Reclamation, Department of Agriculture, Weather Bureau, Coast and Geodetic Survey, and the Tennessee Valley Authority) and from non-government technical consultants.[29]

The President's Task Force report was prepared by a group of non-government consultants which included qualified engineers. It used information from, and the services of, the Army Corps of Engineers, the Department of Agriculture, the Department of the Interior, the Tennessee Valley Authority, and a variety of state and local agencies.[30] According to Deputy Federal Insurance Administrator J. Robert Hunter, Frank Thomas, Staff Specialist with the United States Water Resources Council (USWRC), and

William Cumming, Attorney-Adviser to FIA in HUD's Office of General Counsel, the fields of hydrology and hydraulics are among the few technical fields where the Federal government is the predominant user and source of experts and experience.[31]

Neither of the above studies recommended a particular base flood level to be adopted. Instead, they provided the initial data that Congress needed to enact the NFIP and that FIA would later use to reach its decision on what level of flood to adopt as the base flood.[32]

A key step in forming a consensus on using the one percent flood as the base flood was the Flood Plain Management Guidelines Seminar (hereinafter referred to as the Chicago Seminar) held at the University of Chicago in 1968.[33] HUD contracted with the Center for Urban Studies of the University of Chicago (hereinafter referred to as the Center) to organize and run the Chicago Seminar.[34] Its main purpose was to provide HUD with recommendations to aid in setting up the NFIP. The Center invited to the Chicago Seminar a large group of persons with interests in the problems of flooding and the losses that ensue. The participants included recognized authorities in their respective fields and represented a broad spectrum of interests among the private business sector, the academic community, and state and local governments.[35]

The Chicago Seminar was chaired by Professor Gilbert White of the Department of Geography of the University of Chicago. Each participant was provided sufficient background material to familiarize himself with the major points to be covered at the meeting. Participants could, and did, submit material in advance for consideration at the meeting. Each participant was asked to reassess the recommendations after the Seminar and to send revised comments to the Center. Although the choice of base flood level depended primarily on a determination of an acceptable level of Federal funding and of how much land should be subject to building restrictions, a wealth of technical information was needed to arrive at the decision. Accordingly, a hydrology committee was formed at the Seminar to provide the necessary data. Committee members were chosen because of their expertise, and so as to provide representation of all interests.[36] The committee, and then the Seminar, unanimously recommended the adoption of the 100 year flood (the one percent chance flood) as the base flood, and the FIA ultimately followed this recommendation in 1970.[37] This standard has been reviewed internally at the FIA on several occasions and there has been continual Congressional oversight of the program, but the base flood has not been changed.[38] Executive

Order 11988 (May 24, 1977) now requires all Federal agencies to use the 100 year flood as their basic planning standard.[39]

B(2) FIA's Method of Determining Areas of Special Flood Hazard

The exact method or technique used to determine what area of land will be flooded, and with what probabilities, will vary according to the local conditions. The choice of method depends on the amount and quality of the data available and the nature of the region.[40] River basins are treated differently from coastal zones and the east coast is treated differently from the Gulf or west coasts.[41] All of the methods generally include two steps:[42]

> (a) An estimate is made of the amount of water flow (the volume of water per second) expected to be carried by the river during a flood of a certain probability. This is the flow frequency determination. For coastal regions this determination involves estimates of tides, wave heights, winds, storm surges, and stream flow (if any).
>
> (b) An estimate is made of the height the water will rise above normal water level and the area of land that will be covered by water, given the flow determined in (a). This level will depend upon the topography of the land and what kinds of structures and geological formations exist along the river bank.

The FIA has issued Flood Insurance Study Guidelines and Specifications (hereinafter referred to as FIA Guidelines) which specify the criteria and procedures to be used by parties who perform the flood insurance studies.[43] To perform step (a), FIA requires that the United States Water Resources Council's Flood Flow Frequency Guidelines (hereinafter referred to as USWRC Guidelines) be used where applicable for inland rivers and streams.[44] The modified SPLASH model (Special Program to List Amplitudes of Surges from Hurricanes),[45] a joint probability analysis method devised by the National Oceanic and Atmospheric Administration (NOAA), is generally used for coastal regions. If appropriate gage data for approximately ten years exist, and this is rarely the case, then the gage data will be used. In many regions, no specific engineering method is required by FIA because either the geographical or hydrological characteristics of the region make it impossible to apply the standard techniques, or the required data are unavailable.[46] For example, the USWRC Guidelines have little applicability in areas where measurements of flow do not exist. Even in areas with gage measurements, the model cannot be applied unless records exist for at least ten years.[47]

The data used in the models are obtained from the following sources. The United States Geological Survey (USGS) maintains a network of stream gages throughout the interior of the United

States.[48] The National Ocean Survey of NOAA operates most of the ocean gages and the Army Corps of Engineers over the years, as a result of its many projects, has accumulated certain records from gages placed throughout the United States.[49] Ultimately, FIA damage records from claim reports will provide additional data. Despite the networks of gages a majority of streams in the United States either have no gages or the data are insufficient.[50] In such cases, there are several optional methods of providing the proper data. These methods include using data derived from an average of the measurements over a larger geographic region, using data from up or down stream, adjusting or converting old data to take into account urbanization, or using estimates from climatic data (rainfall and/or snowmelt).[51] The choice of method depends on the engineering judgment of the contractor or Federal agency performing the study. (See discussion of choice of contractor, _infra_.) The USWRC advises that its Guidelines are not to be used mechanically, but rather:

> User decisions must be based on properly applied procedures and proper interpretation of results considering risk and uncertainty. Therefore, the judgment of a professional experienced in hydrologic analysis will enhance the usefulness of a flood frequency analysis and promote appropriate application.[52]

The USWRC Guidelines recommend statistical procedures to be used to determine the flow frequencies which would result in a flood of a specified exceedance probability.[53] The reason different statistical procedures can be used is that:

> Flood events are a succession of natural events which, as far as can be determined, do not fit any one specific known statistical distribution.[54]

The President's Task Force Report and the Flood Plain Management Guidelines Seminar, both described in section B(1), recommended that the USWRC Guidelines be used for determination of base floods. The FIA accepted the USWRC Guidelines as the best available methodology for practical use.[55] J. Robert Hunter, the Deputy Federal Insurance Administrator, stressed that given the acceptable degree of reliability of this method and the statutory mandate to complete all flood determinations no later than August 1, 1983, the FIA was constrained by practicality to use the best feasible model then available.[56] The reliability and accuracy of the extrapolation may be increased by a more complex technique, but the alternative may be more expensive to use. Given unlimited funds and other resources perhaps other methods could be used, but given the size of the task assigned to the FIA and the limited resources, FIA chose uniformity and ease of use.[57] In a report prepared for an administrative appeal of flood height determinations, the National Academy of Sciences, acting as an "independent scientific body," reviewed inter alia the acceptability of the statistical technique. The Academy concluded that although it was "not the ultimate extrapolation method from a scientific point of view," it was acceptable at the time.[58] The methods specified by FIA in its contracts with parties who perform flood insurance studies were also tacitly approved by the Senate Committee on Banking, Housing and Urban Affairs in 1973.[59] The USWRC Guidelines have been updated once by USWRC since their initial issuance in 1967 and will continue to be so modified as new and more reliable techniques become available.[60]

The USWRC Guidelines and the SPLASH model are neither contained in nor specified for use by the statutes creating or amending the National Flood Insurance Program, nor are they included even by reference in FIA's regulations. These methods of determining areas of special flood hazard are considered by FIA to be primarily engineering techniques that need not be spelled out in the regulations.[61] The methods are, however, specified in the FIA Guidelines. F. Melvin Crompton, the Director of the Engineering and Hydrology Division, believes that it is impractical to write down every requirement, condition, or option available to those scientists and engineers performing the flood insurance studies.[62] The questions of when, where, and how to use these methods include deciding which model to use for inland streams, for coastal regions, for hurricane regions, for shallow flooding, and for situations in which there are inadequate data, or where a calculation based solely on previous gage records would not account for changes in flood heights due to urbanization of the region. There is a general feeling within FIA that if an Administrative Procedure Act rulemaking were required every time an engineering procedure or method could be improved, it would substantially delay application of updated techniques in the program.[63] This in turn would lead to what are considered unnecessary inaccuracies in the flood insurance studies.[64]

B(3) The Process of Updating and Improving the Methods

Virtually any model can be updated and improved. The FIA decided, when the program began in 1968, that it would be impractical to wait for an ideal set of models, and adopted for use in the flood insurance studies the best models then available.[65] FIA has performed periodic reviews of the various methods used in the program.[66]

The USWRC Guidelines as used by FIA can be modified either as a result of FIA action or by the USWRC. In the past, FIA has adopted the single revision of the USWRC Guidelines, and it is expected that future revisions will be adopted similarly.[67] The only situation where this might not occur is where the change in method conflicts with a policy decision based on the insurance aspects of the NFIP.[68] Any such conflict would be evaluated by the Engineering and Hydrology Division in conjunction with the insurance personnel at FIA in the manner described below for FIA modification of methods.[69]

Within FIA, the procedure for modifying a method of determining a flood prone region is as follows:[70]

(a) A question is raised as to the adequacy of a particular procedure or step. This can be initiated by FIA's Engineering and Hydrology Division staff or by a non-FIA person. The Engineering and Hydrology Division staff is responsible for identifying problems with the methods used to determine flood prone areas, identifying problems with the way the flood determinations are performed, and evaluating the merit of appeals of flood hazards and flood elevations. The Engineering and Hydrology Division performs no studies of its own, but contracts out those tasks that need to be performed once the problem has been pinpointed. There are approximately seventy authorized positions in the Engineering and Hydrology Division, of which sixty are currently filled. Approximately ten of these are highly qualified technical personnel.[71] The Engineering and Hydrology Division staff can become aware of a deficiency in the method used to determine flood elevation values either as a result of working with the method on a day to day basis or as a result of a particular complaint being raised in a series of administrative appeals of individual flood level determinations.

The procedure which allows a non-FIA person to initiate a change in the flood identification method is not covered by regulation and is informal. All that is necessary is submission of a letter to the Engineering and Hydrology Division explaining the perceived deficiencies or the recommended improvement and, if possible, a description of the actual methodology that should replace the old method. FIA's response to informal suggestions for improving its methodology is illustrated by the recent incorporation into its coastal model of a term which takes into account wave heights. H. Crane Miller, a Washington, D. C., attorney,[72] in an article in Environmental Comment, called attention to the fact that the SPLASH model (and all other existing coastal models) did not include the effects of wave heights.[73] Upon learning informally of Miller's suggestions, J. Robert Hunter, Deputy Federal Insurance Administrator, initiated the methodology modification process described _infra_.

H. Crane Miller has stated that it is significant that, given a relatively obscure reference to a deficiency in its methodology, FIA not only acknowledged that the criticism was valid, but took action on its own initiative to remedy the problem.[74]

(b) The suggestion is evaluated. The Engineering and Hydrology Division has a small staff of technical people who are qualified to evaluate the proposal. There are no written procedures or even informal criteria for evaluating the merit of these proposals. The decision is a matter of engineering judgment and will depend upon the nature of the proposal. One factor FIA considers in this process is whether the method can be uniformly and economically applied in the field.

The staff discusses the proposed modification, and if they form a consensus that the suggestion has merit, it is sent to the Director of the Engineering and Hydrology Division, and then to the Federal Insurance Administrator. The Administrator decides whether further consideration is called for. The preceding steps are quite informal. The tendency is to lean toward full consideration of requests at this early stage.[75] However, if the Administrator gives his approval for further consideration, a study group is formed to make a more detailed evaluation and to draw up preliminary specifications for a possible contract.

This group consists of representatives from the affected divisions of FIA. The study group's draft proposal is submitted to a meeting of the appropriate Assistant Administrator and the division heads for a decision on whether contract proposals should be solicited. The Administrator makes the final decision, but he has generally followed the recommendations of the division heads. In the case of the wave height suggestion, supra, it was decided that the modification could be made and, moreover, that it would improve the model significantly.

(c) If a modification is decided upon, a competent engineering group is sought to modify the old method. The Engineering and Hydrology Division always contracts out modifications of flood models.[76] The choice of contractor is normally made through the competitive bid process specified by the Selection of Architects and Engineers Amendment to the Federal Property and Administrative Services Act of 1949.[77] The FIA Administrator has created an independent board consisting of Federal Government civil engineers who have been recommended by the Director of the Engineering and Hydrology Division.[78] The board evaluates engineering firms and selects the three most qualified. Each firm is sent a letter asking if it is interested in the contract and requesting responses to specific technical questions. When the replies are received the board re-ranks the firms, if necessary, and sends the list to the Administrator. The Administrator, through HUD's Office of Procurement and Contracts, then invites the most qualified firm to submit a formal contract proposal. Price negotiations are handled by the Office of Procurement and Contracts, with technical advice from the Engineering and Hydrology Division. If agreement cannot be reached, the next most qualified firm is solicited.[79]

The Role of the National Academy of Sciences

The National Academy of Sciences (NAS) has a special role in the model updating process as a non-competitive contractor. FIA has a long-term contract with NAS that covers a broad range of tasks.[80] For NAS the contract performance is administered by its Building Research Advisory Board. Whenever FIA requires the services of NAS, it requests (by amendment to the contract) an analysis and solution of the particular problem. The actual work is performed by NAS's Science and Engineering Committee on Prevention and Mitigation of Flood Losses. A given problem is assigned to whichever panel of the full committee is concerned with the appropriate specialized area. For example, the wave height modification for hurricane surges was assigned to the Panel on Wave Action Effects Associated With Storm Surges (Wave Action Effects Panel). Members of NAS panels are composed of experts or expert bodies in the relevant field of interest. Selection is made on the basis of special qualifications and technical competence as well as with regard to what NAS considers "appropriate balance." For each study, a task group is usually appointed by the chairman of the panel to perform detailed studies.

As a result of past experience with the performance of NAS, the FIA (specifically the Engineering and Hydrology Division) has developed some informal criteria to be used to decide which problems are to be given to NAS and how these problems should be presented.[81] The types of problems that are referred to NAS are those that involve judging the validity of a technique, comparing alternative methods, or developing a new technique in an unexplored area. For example, in the early 1970's there were three widely used models for estimating certain kinds of flooding conditions in coastal regions: the United States Geological Survey model, the Army Corps of Engineers model, and the NOAA SPLASH model. FIA assigned to NAS the task of comparing these models with respect to their accuracy, cost, and ease of use, and asked NAS to recommend one for FIA use.[82]

FIA's Director of Engineering and Hydrology feels that experience has shown that NAS is most helpful when provided with an initial draft of a solution to a problem or a selection of alternatives,[83] and this is the procedure currently followed. The reason for this appears to be that, while NAS is strong on evaluative and judgmental issues, it may diffuse its creative efforts if the problem is not narrowly and properly focused. Thus NAS did not produce useful results when asked to devise ways to decrease the time needed for a flood insurance study. Furthermore, it appears that NAS results have been far more satisfactory when the problems given to NAS focused on questions of acceptability of a particular engineering procedure rather than questions of whether a particular method was applied in a reasonable manner. Since the procedures for involving NAS in administrative appeals of flood elevation determinations are similar to those discussed in this section, the preceding observation is particularly pertinent to the role of NAS in appeals. (See section B(5), infra.)

In the case of inclusion of wave heights in coastal models, FIA decided to contract on a non-competitive basis with NAS because the task was an extension of a model into a new area. As an initial step, FIA contracted with Tetra Tech, Inc., a private firm, to produce a proposed solution that was then given to NAS to evaluate. Tetra Tech was selected for this task because it was already under contract with FIA to perform flood insurance studies for coastal regions, and because during the competitive bid selection process for that contract, FIA had determined that Tetra Tech possessed expertise in the specific statistical modeling techniques necessary to make such a modification.[84] NAS evaluated the Tetra Tech modification and revised significant elements of it. The NAS revised approach became the final form. No additional public comment was solicited. FIA now is in the process of deciding whether to include this model in the FIA Guidelines.[85]

FIA's approach to analyzing the feasibility of using remote sensing techniques further illustrates FIA's response to new technology. Some writers have suggested that it would be less expensive to use satellites to gather data on the physical characteristics of a region (watershed features, soil moisture, soil composition differences, and vegetation), and then use those data to predict the boundaries of the region that would be covered by a one percent chance flood.[86] The best spatial resolution currently available from satellite data is 80 meters.[87] FIA has not contracted for a study of this alternative because an 80 meter resolution would give inadequate information for determining whether individual parcels of land are within an area of special flood hazard.[88] However, as a result of informal contacts with the National Aeronautics and Space Administration's Jet Propulsion Laboratory (NASA) and the United States Geological Survey (USGS), personnel at the Engineering and Hydrology Division of FIA were informed that airplane-mounted remote sensing could provide the contour maps necessary for a flood insurance study. Following the updating procedure described in this section, FIA decided to award a contract to NASA to determine the feasibility of the development of this technique into a practical method. The Engineering and Hydrology Division evaluated the overall performance of the NASA proposal in terms of cost effectiveness. No evaluation was made of the remote sensing hardware, since the Engineering and Hydrology Division did not have the technical competence to render an informed judgment. At this stage of the analysis, FIA assumed the system's proposed instrumentation was sound. FIA has concluded that the proposed system is too costly, but the USGS has independently developed a similar remote sensing system which is asserted to be less expensive. NASA is working in conjunction with USGS to produce a combined proposal. The Fiscal Year 1978 appropriations request of HUD was increased by the Congress for further consideration of this proposal.

Office of Policy Development and Research

When research (other than flood insurance studies) is to be contracted out, FIA normally submits the statement of work to HUD's Office of Policy Development and Research (PDR). PDR is a separate Assistant Secretary-level office in HUD with two primary functions: the coordination of all of HUD's housing research projects and the development of long range housing policy. PDR's decisions on the choice of research projects serve to provide focus, avoid duplication, and order research priorities by allocating the limited research funds. The type of study that FIA would handle without going through PDR normally involves the application or further development of an existing technique. Research channeled through PDR involves the development of totally new methodologies or the analysis of a problem that has no currently known solution. For example, FIA submitted to PDR the request for a study of the feasibility of expanding its program to include landslides. In the remote sensing example described *supra*, if the NASA proposal had progressed to the stage where an evaluation of the remote sensing technology were necessary, FIA would have contracted for that evaluation through PDR. FIA is also planning to issue through PDR a request for proposals to study the possibility of quicker and cheaper methods for performing flood insurance studies without losing scientific validity.[89]

B(4) Application of the Flood Determination Method to Individual Communities

In each flood prone community a flood plain must be identified by application of the 100 year (one percent) flood standard. The FIA handles this by contracting out each study, either to another Federal agency or to a private engineering firm. This is necessitated by the size of the task of identifying and studying 22,000 flood prone communities in the United States.[90] At present, approximately 20 percent of the studies are being performed by the Army Corps of Engineers and another 17 percent by other government agencies, primarily USGS, NOAA, and the Tennessee Valley Authority. The remaining 63 percent FIA contracts out to private engineering firms.[91] The Flood Disaster Protection Act of 1973 specifically provides that those Federal agencies already engaged in the identification of flood risk zones in the United States give the "highest practicable priority in the allocation of available manpower and other available resources to the identification and mapping of flood hazard areas and flood-risk zones."[92] The FIA gives first priority to Federal agencies in awarding contracts for the studies, and it chooses only those Federal agencies with experience in assessing flood risk.[93]

The allocation of the studies between Federal agencies and private firms occurs in the regional offices of FIA.[94] First, the communities that are likely to have flood prone areas are identified through discussions with state water resource agency personnel, other local people working with water resources and familiar with the area, and sometimes a Federal agency's local district representative if that agency has experience in performing water resource studies in that community. This group produces a list of probable flood prone areas in the region. Then, FIA's regional directors and flood insurance specialists and the appropriate representatives of the state flood and water resources programs meet to develop priorities within the list. The factors that are considered include the degree of development of the region, its population, the percentage of the community affected by floods, and where new development is occurring.[95] The communities given the highest priority are those that have the highest probability of growth in the flood plain.

Once a list of communities that probably should be studied is prepared, the FIA field coordinators (members of the Field Support Division) meet with the local district representatives of the various Federal water resource agencies, such as the Army Corps of Engineers, USGS, and NOAA. At this meeting it is determined which agencies have information or previous experience with the communities on the list. Essentially, the representatives of each agency choose those communities for which the agency wants to perform the study. The Deputy Federal Insurance Administrator has expressed his satisfaction with the amount of resources these Federal agencies have been able to commit to the studies.[96] A final list of priority communities with an indication of those to be handled by each Federal agency is then sent to the main FIA office in Washington, D. C. The remaining communities are studied by private contractors. The choice of private contractor is made through the competitive bid process described in section B(3) supra.

There are two technical steps in the process of qualifying a community for flood insurance: (1) the production of the Flood Hazard Boundary Map (FHBM), and (2) the production of the Flood Insurance Rate Map (FIRM). These are two very different types of studies which are performed for different reasons and which have different legal effects. There are two levels of participation in the flood insurance program: the emergency program and the regular program. A community which has only an FHBM is qualified only for the emergency program, although completion of an FHBM is not a precondition for participation. An FIRM is required for the regular program.[97]

The FHBM is a copy of the official map of the geographical limits of the local community on which the FIA has noted the boundaries of areas subject to three general types of hazards: flood, mudslide and erosion.[98] The study is performed by at least two consultants, using the same contract award procedure described in section B(3) supra.[99]

Rather than performing on-site surveys, the contractors use existing published data, such as the USGS's Flood-prone Quadrangles and the Army Corps of Engineers' Flood Plain Information Reports. There is no formal consultation with local officials during preparation of the study beyond informing them that a flood hazard identification study is being undertaken, but communities are sent draft copies of the FHBMs and have three weeks to correct and comment on them. From the start of the study until the FHBM is printed takes from six to nine months.[100] The FHBM is not intended to provide elevations or other detailed information, but rather is intended to be a quick identification of general regions that have flood problems, in order to allow the restrictions on construction to be put in force quickly.[101] It is because of this emphasis on speed that there is no formal consultation process required for the production of the FHBM. The

Part 1920 appeal process in the regulations (see section B(5) infra) is designed to correct any errors in the FHBM not noted in the three week review by local community officials. An example of the kind of feature that might be overlooked in a flood hazard identification study would be the small hills or rises within the region that would place some particular property above the one percent chance flood elevation.

The FIRM is the official map of a community on which FIA has indicated the flood elevations and the insurance premium rates for different zones within the areas of special flood hazard. This is simply the product of the flood insurance study described in section B(2) supra. From the time a flood insurance study contract is awarded until an FIRM is announced in the Federal Register as a proposed final determination normally takes about three years.[102] The type of floodproofing and structural restrictions imposed by a community will depend upon the flood elevations. The sources of technical information for the flood insurance study are those discussed in section B(2). In some instances, the community already possesses relevant technical data. FIA is required by statute to hold consultations with local officials, and thereby provide individuals and the community an opportunity to submit such data.[103] According to F. Melvin

Crompton, the amount and quality of technical information obtained from the community officials varies considerably and usually depends on the size and affluence of the community. Many large cities that have their own engineers provide much useful data. Small communities usually provide little technical information. If physical changes occur which would affect flood conditions, e.g., urbanization, the community must submit the new technical data within six months of the date such information becomes available.[104]

FIA vigorously encourages public participation in the program. J. Robert Hunter and F. Melvin Crompton have found that most of the appeals of flood elevation determinations result from a lack of understanding of the program, and therefore feel it is in the interest of FIA's overall long-term efficient operation to disseminate information about the program as widely as possible. Technical information also has been submitted by the general public[105] but normally little technical information is obtained from this source.[106]

In order to maintain quality control and to minimize the number of errors in the flood insurance studies, each completed study is sent to an independent contractor selected by FIA for a review of its accuracy.[107] After this technical review, the flood insurance study is sent to the community and is officially published.[108]

B(5) Resolution of Disputes -- The Appeal Processes

Two procedures are available for resolution of technical disputes concerning maps. First, an informal procedure is provided for an owner or lessee of property to submit his own technical data.[109] This procedure is normally used to correct inadvertent errors, particularly (but not exclusively) in an FHBM. In case of clear factual error, FIA maintains a liberal policy of allowing corrections without time limit. This procedure is intended to remedy errors or oversights resulting from the emphasis on speed in the development of an FHBM. Alternatively, the Flood Disaster Protection Act of 1973 provides that a formal appeal may be taken on flood elevations indicated on an FIRM,[110] and the sole basis for such an appeal is the possession of knowledge or information indicating that such elevations proposed by the FIA "are scientifically or technically incorrect, and the sole relief ... is a modification of the [Administrator's] proposed determination accordingly."[111] There are three administrative appeal steps provided by statute to resolve disputes concerning the scientific or technical accuracy of the elevations on FIRMs: consultation with local officials, submission of the dispute to an independent party, or an administrative hearing.[112] Congress also provided for judicial review of any final determination of an administrative appeal if review is requested within 60 days of receipt of notice of the determination.[113]

The appeal by consultation is simply a continuation of the formal consultation process that occurs during the flood insurance study. If a community (or an owner or lessee of real property within the community) disputes FIA's proposed elevation determinations (the published FIRM), the community submits to FIA (through the FIA regional office) the technical information upon which the appeal is based.[114] This information is evaluated in Washington by the Engineering and Hydrology Division. If the error, omission, or deficiency is obvious, such as when more recent hydrological or topographical data become available after the study is completed, or if the quality of the work performed by the contractor is unacceptable, then FIA will correct the problem.[115] This is done either by awarding another contract (if the size and complexity of the correction is large) or by making the correction internally at FIA (if it is a simple clerical or map copying error).

The quality of the contractor's work can be judged by analyzing whether a sufficient number of measurements were taken, whether standard statistical methods were used, and the more subjective test of whether the methods were applied reasonably. F. Melvin Crompton estimates that a majority of appeals are based on either a misunderstanding of what the FIRM means or on the availability of better data.[116] If the consultation resolves the dispute, FIA must publish its final determination within a reasonable time.[117]

If consultation does not resolve the dispute, the Director of the Engineering and Hydrology Division may submit the conflicting data to an "independent scientific body" or an appropriate Federal agency.[118] The appeals that go beyond the consultation stage are usually not just disputes of measurements, but rather are disputes over the validity of statistical techniques or the judgment of the contractor.

The regulations define an "independent scientific body" as "a non-federal technical or scientific organization involved in the study of land use planning, flood plain management, hydrology, geology, geography, or any other related field of study concerned with flooding."[119] This refers to private engineering firms or other organizations (such as NAS) which would be qualified to perform the original flood insurance study. Similarly, appropriate Federal agencies are those qualified to perform the original flood insurance study. (See section B(4) supra.) The Engineering and Hydrology Division in disputed cases will select a private firm, organization, or a Federal agency using the same criteria described in section B(4) for the selection of a contractor, except that the contractor who performed the disputed flood insurance study is excluded from consideration.

Whether the National Academy of Sciences is selected as the contractor at this point depends on the same considerations described in section B(3) for selecting a contractor to update the models used to determine the flood elevations. The types of problems that are referred to NAS are those that involve judging the validity of a technique or deciding whether other techniques should be used. The distinction can be illustrated by comparing the Falmouth, Cedar Falls, and Newport Beach appeals. The Cedar Falls and Newport Beach cases were referred to NAS and the Falmouth case was given to Dames and Moore, a private firm. The Cedar Falls appeal questioned the appropriateness of an assumption made by the contractor (the Corps of Engineers) in the flood insurance study, and the validity of using the statistical distribution technique specified by FIA.[120] The United States Geological Survey had independently calculated flow frequencies for its own purposes, with the results differing from the Corps' figures. NAS considered the two studies and concluded that the assumption in question was "a reasonable and conservative judgment," and that the statistical technique was "acceptable ... at this time."[121] The Newport Beach appeal was given to NAS because it was a community in a coastal region where no standard method had been adopted by USWRC or recommended by FIA. The city had hired engineers to perform a flood study and their results conflicted with the FIA contractor's results (USGS). NAS, in this case, agreed with the values determined by the USGS for some components, with the city's values for other components, and disagreed with both on certain components.[122] In its report on the Newport Beach case, the NAS noted that

> until the FIA establishes criteria and provides its contractors with specific guidance on what elements must be considered in FIA flood studies of West Coast communities and on how those elements are to be dealt with, the situation arising in Newport Beach can be expected to be the rule rather than the exception.[123]

The Falmouth appeal, in contrast, involved a dispute over factual data and whether the Corps of Engineers had properly used the standard statistical techniques. Dames and Moore concluded that the Corps had used the correct data in an appropriate manner.[124]

A secondary consideration in deciding whether to use NAS is the complexity of the dispute. There are some appeals where the scientific expertise and prestige of the NAS may encourage the appealing party to end the appeal at the conclusion of this step, and not request an administrative hearing or go to the United States district court.[125] Exactly how much weight to accord to this factor in any given decision to use NAS is difficult to assess.

When the independent party has completed its study, it submits the results to the Administrator (through the Director of the Engineering and Hydrology Division) who makes the final determination within a reasonable time.[126] In all cases to date the Administrator has adopted the results of the independent party's study as his own final determination.

If the dispute has not been settled as a result of the consultation or after submission to an independent party, or if the Administrator determines that submission to an independent party would not resolve the dispute, an appellant community (but not an individual in his capacity as owner or lessee of real property) may obtain a hearing before an administrative law judge (hereinafter referred to as ALJ).[127] To date, the administrative hearing has not been requested by any communities, but HUD has recently assigned ALJs to hear such cases as they may arise and has adopted rules of procedure to govern such a proceeding. Under these rules of procedure, as in the earlier steps of the appeal process, the scope of review for such a hearing is limited to an examination of the scientific or technical correctness of the elevations proposed in the FIRM. There is a transcript of the proceeding and all testimony is taken under oath. The FIA flood elevation determination docket file on the community, containing all notices, reports, filings, comments and materials obtained through the consultation process, is admissible as evidence. In general, the legal rules of evidence are not in effect at the hearings, but only evidence that is relevant to issues within the scope of review is admissible.[128] Both documentary and testimonial evidence are admissible. Non-expert testimony is admissible at the discretion of the ALJ. The burden of proof is on the appellants to prove that the flood elevation determination is not scientifically or technically correct.

A unique characteristic of this proceeding is that the ALJ may submit conflicting technical or scientific data to an independent scientific body or an appropriate Federal agency.[129] Since no ALJ has yet heard a case, there is no established procedure for selecting the independent party. It is the opinion of the staff in the General Counsel's office of HUD associated with the FIA that, although they are free to do so, an ALJ will not normally seek outside advice, but simply will decide the case on the basis of whether the FIA has followed the applicable regulations and statutes.[130]

The ALJ must make a written determination within 30 days of the conclusion of the hearing. The proposed determination of the Administrator (i.e., the FIRM) is modified in accordance with the ALJ's determination and it is binding on the Administrator.[131]

A person aggrieved by the final determination of the administrative appeal may file suit in the United States district court for the district which contains the flood prone community.[132] The appeal must be filed within 60 days of receipt of notice of the Administrator's final determination.[133] The scope of review is as provided in the Administrative Procedure Act,[134] modified by the statutory provision that the initial administrative appeal could be based only on "possession of knowledge or information indicating that the elevations being proposed [in the FIRM] are scientifically or technically incorrect."[135]

B(6) Flood Plain Management Regulations

The National Flood Insurance Act provides that flood insurance shall not be sold or renewed within a community unless the community has adopted adequate flood plain management regulations consistent with Federal criteria.[136] The most recent regulations (24 CFR Part 1910) were issued by HUD late in 1976. There has been controversy surrounding these regulations because some critics of the NFIP consider them an imposition of Federal standards on local communities in an area traditionally controlled by local government,[137] and because they may limit development in a community's flood plain and increase the short term cost of such development.

There are basically two areas where technical decisions are necessary: in the development of management criteria and in their application. The flood plain management regulations provide the minimum criteria that a community must use in formulating effective local ordinances which are applicable to new construction within a flood plain. For existing structures the regulations apply only to substantial improvements. The criteria are deliberately expressed as generally as possible to permit the local government the flexibility to fashion regulations appropriate for the unique local conditions. Conditions vary widely throughout the country and it is felt this flexibility is necessary to enable the program to work.[138]

Development of the Flood Plain Management Criteria

There are separate minimum requirements for flood, mudslide, and erosion prone areas. There are different criteria depending upon how complete the flood hazard and elevation data are.[139] The criteria for flood prone areas which have all the flood elevation values available (from the FIRM) will be used to illustrate technical information-gathering procedures. The initial drafting of regulations setting flood plain management criteria is done by the staff of the Flood Plain Management Division. Congress provided four guides for the development of the criteria. The criteria should:

> 1. constrict the development of land which is exposed to flood damage where appropriate,
>
> 2. guide the development of proposed construction away from locations which are threatened by flood hazards,
>
> 3. assist in reducing damage caused by floods, and
>
> 4. otherwise improve the long-range management and use of flood-prone areas.[140]

In their present form the regulations contain several basic strictures, applicable to new construction and to substantial improvements to existing structures:[141]

> 1. No structure can be built in the floodway that would increase the height of the one percent chance flood by one foot or more. The floodway is that path within the flood plain by which the water from a flood flows out of the region. If a structure is built in this region it will not only be subjected to greater danger, but also will block the flow of water out of the flood plain and thereby increase the height to which the water rises.
>
> 2. All residential buildings constructed in the flood plain must have their lowest floor, including any basement, above the height of the one percent chance flood level.
>
> 3. All non-residential buildings constructed in the flood plain must be constructed with the lowest floor above the one percent flood level, or the structure must be designed so that all parts of the building below that level will be floodproof.
>
> 4. If floodproofing is used, a registered professional engineer must certify that the floodproofing measures are adequate to withstand the expected flood depths, pressures and uplift forces.
>
> 5. All mobile homes within the flood plain must be elevated above the one percent flood level in accordance with detailed specifications.

6. There are other floor height requirements for areas of shallow flooding within the flood plain.

The initial step in generating standards was the 1968 Flood Plain Management Guidelines Seminar. (See section B(1) supra.) The recommendations of the Seminar were presented to the FIA for its use in developing its regulations. The criteria listed above are derived substantially from those recommendations.[142]

The choice, for example, of the floodproofing standard that was ultimately adopted by FIA was made by the staff of the Flood Plain Management Division.[143] The emphasis of the flood program at its outset was heavily weighted toward the problems of identifying the flood prone areas.[144] Thus generally there were no independent tests or studies commissioned or performed by FIA to develop any of the flood plain requirements. Existing performance and consensus standards used by other agencies or organizations were adopted.[145] For example, the mobile home anchoring standards (to prevent flotation or lateral movement) in areas with an FHBM, but no FIRM, were adopted wholly from the specifications of the Association of Mobile Home Manufacturers (AMHM).[146] The decision to adopt the AMHM standard was made by the Flood Plain Management Division staff person assigned to the question. She reviewed several pamphlets on the subject, contacted some Congressional Committee staff members familiar with the problem, and discussed the standards with representatives of the AMHM.[147] No independent study of the adequacy of the standard was considered or desired at that time. However, in general, the standards used in the flood plain management criteria now undergo periodic review.

The reliance on pre-existing standards has changed, and there are now under way technical studies initiated by the Flood Plain Management Division. When such studies are necessary, the Flood Plain Management Division, through the Office of Policy Development and Research and the Office of Procurement and Contracts, puts the task up for competitive bidding.[148] The procedure used for choosing a contractor is identical to that used by the Engineering and Hydrology Division in selecting contractors for the FIA. (See section B(4) supra.) According to W. Curtis Chandler, Civil Engineer with the Flood Plain Management Division, there has not yet arisen a problem which is analogous to the revision of the flood determination methodology, and therefore there are no established procedures or recognized types of problems that would be presented to NAS or a similar organization.

Once the FIA has drafted regulations, the Administrative Procedure Act §553 rulemaking procedures are followed.[149] In addition to the required publication in the Federal Register and receipt of comments through that procedure, before the latest set of regulations became final, the FIA voluntarily held a series of public meetings during the summer of 1975 in seven cities throughout the United States.[150] A person or organization could submit a written statement or make an oral presentation. The primary purpose of these meetings was to gather public comment on the overall operation of the program, although not specifically on technical questions.[151] Nevertheless, a small amount of technical comment was obtained. Complaints about the accuracy of the flood determination methodology and comments from professional engineers on anchorage and piling requirements were received. The information gathered from these meetings as well as the public comments from the Federal Register notice were considered in modifying the proposed regulations.

Application of the Criteria

Local building ordinances for flood plains within communities which are in the Federal insurance program must be approved by FIA.[152] This is not primarily a technical review, but simply a verification of conformity with FIA's minimum criteria. The review is performed by non-technical personnel in the regional and Washington offices of FIA.[153]

Technical information is involved in the process of deciding whether to grant an exception to a community which views the application of specific building requirements as too onerous a burden.[154] Requests for exceptions are sent to the Flood Plain Management Division through the regional office. They must include "economic, environmental, topographic, hydrologic, and other scientific and technical data"[155] which support the exception. In the only case where this has occurred (Fargo, North Dakota), the Flood Plain Management Division consulted with the Engineering and Hydrology Division in reaching a decision.

The regulations require that if FIA grants an exception to the requirement that the lowest floor of any residential structure be at or above the base (one percent) flood level, then any portion of such a structure below that level must be floodproofed.[156] There are two methods of obtaining approval of the floodproofing. Each structure affected by an exception may be individually certified by a qualified engineer or architect, or the community may submit to FIA an ordinance detailing floodproofing requirements which satisfy FIA's watertight performance standards.[157] For non-residential structures, construction may take place below the one percent level without the necessity of seeking an exception. In such cases, however, floodproofing is required, and the procedure for approval is the same as for residential structures.[158]

In the case of Fargo, North Dakota, the community sent its ordinance to the FIA for review and approval. Since the Flood Plain Management Division did not have the personnel to enable it to perform such an undertaking, a contract to perform the job was given to the National Association of Home Builders Research Foundation (NAHBRF).[159] NAHBRF was chosen on a non-competitive basis because it possessed the expert knowledge and experience to accomplish the job. The Engineering and Hydrology Division modified an existing contract with NAHBRF under which this task could be performed.[160] Future similar cases will be contracted out and, depending upon the exact nature of the problem, NAHBRF might be used again.

The National Flood Insurance Act does not specifically provide for either agency or judicial review of flood plain management regulations, beyond the provisions of the Administrative Procedure Act.[161] An individual or a community with a reason for challenging a particular application of the criteria can submit a request for a variance or an exception. In _Bolen_ v. _United States_,[162] the plaintiff attacked the regulations on the grounds that they violated the Fifth, Tenth and Fourteenth

Amendments. The FIA was granted summary judgment and no appeal was filed.

The NFIP is subject to the requirements of the National Environmental Policy Act of 1969 (NEPA). One of the goals of the NFIP is to induce local governments to develop their own land use criteria and long-range plans for flood prone areas. These goals comport with the overall purpose and policy of NEPA. Under NEPA:

> [I]t is the continuing responsibility of the Federal Government to use all practicable means. . .to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may. . .(3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences . . . . (emphasis added)[163]

The personnel at the FIA feel that preparing an Environmental Impact Statement (EIS) is not merely something that must be done because it is legally required. It is felt that in many cases, and in particular with the Flood Plain Management Criteria, the process of exploring all alternatives and weighing long-term harmful effects against short-term benefits aids in developing the substance of the regulations.[164] As part of this process FIA may identify the need for a study of the effects of alternative criteria or the effects of the existing regulations in a particular type of locale, e.g., in wetlands areas.[165] In general, the process of preparing an EIS is considered an opportunity to refine the regulations rather than an administrative burden.

C. General Observations

In several interviews at the FIA, there was expressed a frustration or impatience with some of the delays that occur in the system. This was expressed both in the Engineering and Hydrology Division[166] and in the Flood Plain Management Division.[167] Several years ago the Engineering and Hydrology Division contracted with the NAS to study how to decrease the time it takes to perform a flood insurance study while maintaining quality. The results of the contract were not useful, but the study reflects the concern at the FIA over the length of time it takes to implement the program. F. Melvin Crompton felt that the major source of delay is in the consultation process.[168] Richard Krimm, Assistant Administrator, Office of Flood Insurance, FIA, was particularly concerned over the length of time it took to put the latest version of the regulations into final form (they were first proposed in March 1975, published in their final form in October 1976, and became effective December 1, 1976).[169]

All technical research and testing required by HUD is contracted out. F. Melvin Crompton, Director of the Engineering and Hydrology Division, feels that both in general and in connection with the specific needs of the NFIP, contracting out the work is the best method of handling the problems that arise.[170] It helps prevent the agency from developing a narrow outlook or becoming wedded to one method of doing things. For example, the FIA was able to choose among various existing coastal flood models, and even after choosing the NOAA SPLASH model it was able to contract out for improvements in it. The agency is given a wider choice of experts and can quickly change the emphasis of its research or adjust to new conditions without large shifts in agency personnel. For the NFIP in particular, using local engineering firms or Federal agencies that have previously performed work in the region not only provides more experience with peculiar local conditions, but gives the community more confidence in the results of the study.[171]

FOOTNOTES

1. See generally National Flood Insurance Act of 1968, 42 U.S.C. §4001 *et seq*. (1970), as amended by Flood Disaster Protection Act of 1973, Pub. L. No. 93-234, 87 Stat. 975. The term "flood", as used in the National Flood Insurance Program, also includes (i) inundations from mudslides, and (ii) collapse or subsidence of land along a shore as a result of erosion or undermining by storm-induced waves or currents. 42 U.S.C. §4121 (Supp. IV 1974). See also 24 C.F.R. §1909.1 (1977). There is considerably more uncertainty and difficulty in defining regions prone to these hazards than flood prone regions. See Panel for Delineating Mudslide Hazard Areas, *Methodology for Delineating Mudslide Hazard Areas* (National Academy of Sciences 1974). The present report will be limited to problems of flooding because the procedures used for technical determinations are similar for mudslides and erosion.

2. S. Rep. No. 583, 93d Cong., 1st Sess. (1973), reprinted in [1973] U.S. Code Cong. & Ad. News 3217, 3219 (hereinafter cited as S. Rep. No. 583).

3. See 24 C.F.R. Part 1912 (1977). Part 1912 describes the functions and requirements of private insurance companies with respect to the Federal flood insurance program.

4. 24 C.F.R. §§1912.3, 1912.4 (1977).

5. 42 U.S.C. §4054 (Supp. IV 1974). This section, as amended by Pub. L. No. 93-234, §111, 87 Stat. 975, now allows FIA to take into account long term loss experience. The earlier version prescribed a fixed formula for sharing losses between government and industry. See S. Rep. No. 583, *supra* note 2, at 3231.

6. 42 U.S.C. §4013 (Supp. IV 1974); 24 C.F.R. §1911.3 (1977).

7. HUD, *Insurance and Other Programs for Financial Assistance to Flood Victims*, Senate Committee on Banking and Currency, 89th Cong., 2d Sess., 26-28 (Committee Print 1966) (hereinafter cited as HUD Feasibility Study). HUD was directed, under the Southeast Hurricane Disaster Act of 1965, Pub. L. No. 89-339, §5, 79 Stat. 1310, to undertake a study of alternatives available to the Federal government for decreasing the long term damage from flooding. This study provided Congress with data to support the enactment of the National Flood Insurance Act of 1968.

8. Id. at 31.

9. Id. at 30-32.

10. 42 U.S.C. §4102 (1970) authorizes FIA to develop criteria for land management and use. 42 U.S.C. §4012(c) (1970) requires a community to demonstrate that it has adopted local ordinances that comply with the Federal criteria. See 24 C.F.R. Part 1910, Subpart A (1977). The purpose of the criteria and subsidized insurance is to reduce, and eventually replace, flood disaster relief expenses. The regulations covering flood plain management criteria are discussed in section B(6) infra.

11. 24 C.F.R. §1910.3 (1977); S. Rep. No. 583, supra note 2, at 3234-35.

12. Housing Authorization Act of 1976, Pub. L. No. 94-375, §14, 90 Stat. 1075 (1976) (amending 42 U.S.C. §4106 (Supp. IV 1974)). See also 24 C.F.R. §1919.6 (1977).

13. 42 U.S.C. §§4012a, 4106 (Supp. IV 1974). Under the National Flood Insurance Act of 1968 there was no denial of Federal money for non-participation. Despite attempts to publicize the existence and benefits of the program, few communities participated. The Flood Disaster Protection Act of 1973, Pub. L. No. 93-234, 87 Stat. 975, added the provisions for denial of Federal funds.

At the time of this writing, each House of Congress has passed an amendment that would permit Federally insured lending institutions to extend loans to property owners in areas designated as areas of special flood hazards, even when the local community has refused to join the NFIP and has not adopted the required building restrictions (the minimum flood plain management criteria-see section B(6) infra). House Boosts Aid Share For Older Cities, 35 Congressional Quarterly Weekly Report 891, 892 (May 14, 1977) and K. Gest, Senate Extends Urban Aid, Housing Programs, 35 Congressional Quarterly Weekly Report 1193, 1195 (June 11, 1977).

14. 42 U.S.C. §4012a (Supp. IV 1974).

15. Alternative terminology refers to an X percent chance flood as a 100/x year flood. Thus a one percent chance flood is the same as a 100 year flood, a two percent chance flood is a 50 year flood, etc.

16. 24 C.F.R. §1909.1 (1977).

17. 24 C.F.R. §1909.1 (1977).

18. The mathematical formula for this calculation is in United States Water Resources Council, Guidelines For Determining Flood Flow Frequency, Bulletin No. 17, Appendix 10 at 1 (March 1976) (hereinafter cited as USWRC Bulletin #17).

19. Telephone interview with William Cumming, Attorney-Adviser in the Office of the General Counsel, HUD (December 20, 1976) (hereinafter cited as the Cumming interview); joint interview in Washington, D. C., with J. Robert Hunter, Deputy Federal Insurance Administrator, F. Melvin Crompton, Director of the Engineering and Hydrology Division of FIA, and H. Joseph Coughlin, Special Assistant to the Assistant Administrator, Office of Flood Insurance, FIA (November 18, 1976) (hereinafter cited as the Hunter interview).

20. 42 U.S.C. §4121(a)(1) (1970).

21. 24 C.F.R. §1909.1 (1977).

22. S. Rep. No. 583, supra note 2, at 3221.

23. HUD Feasibility Study, supra note 7, at 1-2; Center for Urban Studies of the University of Chicago, Report on Flood Plain Management Guidelines Seminar I-2 (1969) (hereinafter cited as the Report on the Flood Seminar). The Seminar is described in the text at pp. 9-10 infra.

24. HUD Feasibility Study, supra note 7, at 49-56; Report on the Flood Seminar, supra note 23, at I-7 - I-10.

25. Hunter interview, supra note 19.

26. Hunter and Cumming interviews, supra note 19.

27. HUD Feasibility Study, supra note 7.

28. Task Force on Federal Flood Control Policy, A Unified National Program for Managing Flood Losses, H. Doc. No. 465, 89th Cong., 2d Session (1966) (hereinafter cited as the Flood Task Force Report). The President appointed a Task Force to provide "guidance in dealing with flood losses by a wide variety of means." The Task Force was chaired by Professor Gilbert White of the University of Chicago, who also chaired the 1968 Flood Seminar. (See text at p. 10 infra.)

29. HUD Feasibility Study, supra note 7, at 137-140.

30. Flood Task Force Report, supra note 28, at 111.

31. The Federal government is the primary source of funding in this area

of research. Hunter interview, supra note 19; Cumming interview, supra note 19; and interview with Dr. Frank Thomas, Staff Specialist, United States Water Resources Council, in Washington, D. C. (January 11, 1977) (hereinafter cited as the Thomas interview).

32. Hunter interview, supra note 19.

33. Hunter interview, id., and telephone interview with Richard Krimm, Assistant Administrator, Office of Flood Insurance, FIA (December 29, 1976) (hereinafter cited as the Krimm interview).

34. Report on the Flood Seminar, supra note 23, at IV-2. The information that follows is derived from Section IV of the Report (Methodology). The Hunter and Krimm interviews confirmed this description of the Seminar and the importance of the Seminar to the NFIP.

35. Report on the Flood Seminar, supra note 23, at 1-3 (Exhibit A). The participants included technical engineering experts, economists, actuaries, attorneys, and economic and urban planners.

36. Committees on planning and policy were also formed. Their recommendations for flood plain management are discussed in section B(6) infra.

37. Report on the Flood Seminar, supra note 23, at I-9, and comments by Theodore Levin, Chief Economist, FIA, on initial draft of the present report (May 1977) (hereinafter cited as Levin comments). See also 36 Fed. Reg. 24,760 (1971).

38. Hunter interview, supra note 19.

39. 42 Fed. Reg. 26,951 (1977).

40. Telephone interview with F. Melvin Crompton, Director of the Engineering and Hydrology Division of FIA (January 5, 1977) (hereinafter cited as the Crompton telephone interview).

41. Panel on Coastal Surges, 100 Year Coastal Water Flooding of the City of Newport Beach, California: A Summary of a Meeting Held to Discuss Issues Raised by the City of Newport Beach Concerning the Preliminary Study Results of the U. S. Geological Survey, 11 (National Academy of Sciences 1976) (hereinafter cited as the Newport Beach Report). This report is discussed more fully in section B(5) infra.

42. Panel on Flood Studies in Riverine Areas, Review of Flood Insurance Studies Conducted on Cedar Falls, Waterloo, and Cedar Rapids, Iowa, 8 (National Academy of Sciences 1974) (hereinafter cited as Cedar Falls

Review).

43. FIA, Flood Insurance Study Guidelines and Specifications (1976). This material is available to the public. See also FIA, Schedule For Flood Insurance Studies (December 1976).

44. USWRC Bulletin #17, supra note 18. The USWRC is an independent government agency whose membership includes the Secretaries of Agriculture, Army, Commerce, HUD, Interior, and Transportation, the Administrator of the Environmental Protection Agency, and the Chairman of the Federal Power Commission. The Attorney General, the Chairmen of the Council on Environmental Quality, the Tennessee Valley Authority, several River Basin Commissions and Basin Interagency Committees, and the Director of the Office of Management and Budget also participate as observers in the activities of USWRC. The Council's activities "encourage the conservation, development and utilization of water and related land resources on a comprehensive and coordinated basis by Federal, State, local government and private enterprise." (United States Water Resources Council, The Nation's Water Resources: Summary Report, at xi (1968)). As a result of recommendation 2 of the report by the Flood Task Force (supra note 28, at 22-23), USWRC was assigned by President Johnson the responsibility of developing a uniform technique for the determination of flood flow frequencies for all Federal agencies. In 1967, through its Hydrology Committee, USWRC issued the first version of a recommended uniform technique (United States Water Resources Council, A Uniform Technique for Determining Flood Flow Frequencies: Bulletin #15). The Hydrology Committee is composed of technical representatives from each member agency. Consultants and Federal agencies, such as the United States Geological Survey, are used to produce the technical reports, and the committee makes recommendations based upon those reports. (Thomas interview, supra note 31.) USWRC has a continuing responsibility to improve and refine the flood flow frequency techniques. The most recent version appears in Bulletin #17 (March 1976). Bulletin #17 is currently being revised to correct some minor technical errors. The USWRC bulletins do not have the force of law, but all Federal agencies and State and local governments are encouraged by USWRC to use the uniform technique. See Exec. Order No. 11,296, 31 Fed. Reg. 10,663 (1966); United States Water Resources Council, Flood Hazard Evaluation Guidelines For Federal Executive Agencies (May 1972). See also Exec. Order No. 11988, 42 Fed. Reg. 26,951 (1977), which requires each Federal agency to perform specific types of analysis and to formulate regulations, in order to accomplish the overall goal of providing leadership in avoiding adverse and incompatible development in the flood plain. FIA has been a leading promoter of uniformity in the flood determination methods utilized by Federal

agencies. Telephone interview with William Cumming, Attorney-Adviser in the Office of General Counsel, HUD (March 2, 1977) (hereinafter cited as the second Cumming interview).

45. C. Jelesnianski, SPLASH, Part 1 - Landfall Storms, NOAA Technical Memorandum (NWS TDL-46 1972).

46. Crompton telephone interview, *supra* note 40.

47. USWRC Bulletin #17, *supra* note 18, at 2.

48. *Id.* at 4.

49. Crompton telephone interview, *supra* note 40.

50. Crompton telephone interview, *id.*

51. USWRC Bulletin #17, *supra* note 18, at 5-6.

52. *Id.* at 1.

53. *Id.* at 3.

54. *Id.* at 9. The Guidelines were developed by USWRC to provide a uniform technique for the determination of flood flow frequencies for all Federal agencies. (See USWRC Bulletin #15, *supra* note 44, at 5.) Nevertheless, some agencies, when using the USWRC Guidelines for their own purposes, do not always use the suggested statistical distribution (e.g., the Soil Conservation Service, the U. S. Geological Survey, and the Army Corps of Engineers). (Thomas interview, *supra* note 31.)

55. Hunter interview, *supra* note 19.

56. Hunter interview, *id.* Other techniques may be equally reliable, depending upon individual circumstances, such as using the educated ("eyeball") estimate of the one percent flood water surface elevation by an experienced hydrologist familiar with the particular watercourse. One of FIA's reasons for preferring standardized techniques is that they are more likely to be upheld by courts upon judicial review. (Thomas interview, *supra* note 31.)

57. Hunter interview, *supra* note 19.

58. Cedar Falls Review, *supra* note 42, at 11 and 20.

59. S. Rep. No. 583, *supra* note 2, at 3221.

60. USWRC Bulletin #17, *supra* note 18, at 1.

61. Crompton telephone interview, *supra* note 40.

62. Crompton telephone interview, *id*.

63. Crompton telephone interview, *id*., and Hunter interview, *supra* note 19.

64. Crompton telephone interview, *supra* note 40.

65. Hunter interview, *supra* note 19.

66. Hunter interview, *id*.

67. Crompton telephone interview, *supra* note 40.

68. Crompton telephone interview, *id*.

69. Crompton telephone interview, *id*.

70. Hunter interview, *supra* note 19. The description in section B(3) of the procedural steps and the hurricane surge example were provided during the Hunter interview. There are no written procedures for updating the model.

71. Crompton telephone interview, *supra* note 40.

72. H. Crane Miller was formerly counsel to the Subcommittee on Oceans and Atmosphere, Committee on Commerce, United States Senate. He also served as legal adviser to the Commission on Marine Science, Engineering and Resources and as assistant general counsel of the Smithsonian Institution.

73. H. Crane Miller, *Coastal Flood Plain Management and the National Flood Insurance Program: A Case Study of Three Rhode Island Communities*, Environmental Comment, November 1975, 1, at 13-14.

74. H. Crane Miller letter (May 2, 1977).

75. Hunter interview, *supra* note 19.

76. Telephone interview with F. Melvin Crompton, Director of the Engineering and Hydrology Division of FIA (March 3, 1977) (hereinafter cited as the second Crompton telephone interview).

77. 40 U.S.C. §541 (Supp. IV 1974).

78. Crompton telephone interview, supra note 40. The bulk of the description in this subsection is from this interview.

79. 40 U.S.C. §544 (Supp. IV 1974).

80. A description of the structure of NAS is given in the Cedar Falls Review, supra note 42, at 4. There are no other organizations that are used on a non-competitive basis in model updating, but on other technical matters, the National Association of Home Builders Research Foundation (NAHBRF) and the American Institute of Architects (AIA) have been given non-competitive contracts (see infra p. 48). These are all non-profit organizations which have unique expertise in their respective areas. The method of selection and the criteria for selecting NAHBRF and AIA are similar to those described for NAS.

81. Crompton telephone interview, supra note 40; Hunter interview, supra note 19. The Director of the Engineering and Hydrology Division makes the final decision on these matters. F. Melvin Crompton initiated the NAS consultation process described here. The comments and evaluations provided in this section are primarily Mr. Crompton's. H. Joseph Coughlin and J. Robert Hunter also expressed satisfaction with this method of using NAS.

82. Crompton telephone interview, supra note 40.

83. Crompton telephone interview, id.

84. Second Crompton telephone interview, supra note 76.

85. As an interim measure, FIA has added one or two feet of protection in its flood plain management criteria for coastal regions. Compare 24 C.F.R. §1910.3(e)(4)(i) (1977) with 24 C.F.R. §1910.3(c)(2) (1977).

86. A. Rango and A. Anderson, Flood Hazard Studies in the Mississippi River Basin Using Remote Sensing, 10 Water Resources Bulletin 1060, 1066-67 (1974).

87. Id. at 1061.

88. Second Crompton telephone interview, supra note 76. The textual description of FIA's consideration of remote sensing is based on that interview.

89. Levin comments, supra note 37.

90. Crompton telephone interview, supra note 40.

91. Hunter interview, supra note 19. The figures cited are for the numbers of studies performed. In terms of the amount of funds allocated in 1976, 22% went to the Army Corps of Engineers, 9% to all other Federal agencies, and 69% to private engineering firms. The variation is due to differences in the size of the communities studied. At one time the contracting Federal agencies sometimes subcontracted with private engineering firms, but now FIA requires the Federal agencies to perform the studies themselves. Telephone interview with F. Melvin Crompton, Director of the Engineering and Hydrology Division of FIA (April 21, 1977).

92. Flood Disaster Protection Act of 1973, §204, 42 U.S.C. §4101(c) (Supp. IV 1974).

93. Hunter interview, supra note 19. Nothing in the statute specifically requires the Administrator of FIA to give priority to the Federal agencies.

94. Crompton telephone interview, supra note 40. Information about the allocation procedure described here was derived primarily from this interview, supplemented with information from an interview with H. Joseph Coughlin, Special Assistant to the Assistant Administrator of FIA, in Washington, D. C. (November 18, 1976) (hereinafter cited as the Coughlin interview). The Coughlin interview was distinct from the Hunter interview the same day, supra note 19, in which Coughlin also participated.

95. Coughlin interview, supra note 94.

96. In 1975 a General Accounting Office report, GAO, National Attempts To Reduce Losses From Floods By Planning For And Controlling The Uses Of Flood-Prone Lands 33-35 (1975), concluded that other Federal agencies were not allocating sufficient resources to flood hazard identification. In GAO, Formidable Administrative Problems Challenge Achieving National Flood Insurance Program Objectives 36-38 (1976), GAO concluded that although other Federal agencies were attempting to give FIA the highest practical priority, better coordination was needed. In the Hunter interview, supra note 19, J. Robert Hunter expressed his satisfaction with the present situation. F. Melvin Crompton stated that he was pleased with the present mix of Federal and private contract work. Third Crompton interview, supra note 91.

97. If a community has an FHBM, but not an FIRM, it must either join the emergency program or become subject to the sanctions against the use of direct or indirect Federal funds one year after it has been formally notified by FIA that an area of special flood hazard exists in that community. (42 U.S.C. §4105(d) (Supp. IV 1974); 24 C.F.R.

§1909.2 (1977).) FIA encourages communities to participate in the emergency program, whether or not an official flood hazard determination (FHBM) has been made. (Second Cumming interview, supra note 44.) If an unmapped community agrees to participate, flood insurance normally can be sold within six days after the local government has adopted, and FIA has approved, ordinances that comply with FIA's minimum flood plain management criteria (see section B(6) infra). (24 C.F.R. §1909.3 (1977).) Authorization for the emergency program ends September 30, 1977, but Congress is expected to pass another extension. (Cumming interview, supra note 19.) To be in the regular program a community must have an FIRM. Normally, the community will also have an FHBM. The amount of insurance coverage available in the regular program is greater than in the emergency program. (24 C.F.R. §1911.6 (1977).) As of June 30, 1977, only 1193 communities were in the regular program, 14,392 were in the emergency program (1,356 of these communities with no flood maps), and another 3,898 communities which have FHBMs were not in either program. (HUD - FIA, Consolidated List of Communities Participating in the National Flood Insurance Program as of June 30, 1977. This list is published bimonthly and each issue supersedes all prior editions.)

98. See definition of "flood" in 24 C.F.R. §1909.1 (1977).

99. Crompton telephone interview, supra note 40.

100. Crompton telephone interview, id., and letter from J. Robert Hunter, Deputy Federal Insurance Administrator to authors (April 8, 1977). The Hunter letter contains comments on a draft of the present report.

101. Hunter interview, supra note 19. There is a one year period after notification of designation of an area of special flood hazard before Federal money is cut off. 42 U.S.C. §4105(d) (Supp. IV 1974).

102. Some studies with special problems have lasted as long as seven years. Crompton telephone interview, supra note 40.

103. 42 U.S.C. §4107 (Supp. IV 1974).

104. New urban development may have major effects on potential flood patterns. FIA requires local communities to submit new technical data whenever development may increase flood height by one foot or more. 24 C.F.R. §1915.5 (1977). FIA has an announced policy of reviewing the maps every five years. It is felt within FIA that these practices should be adequate to account for the effects of urbanization. Telephone interview with Nicholas Lally, Director of the Flood Plain Management Division of FIA (April 22, 1977).

105. Army Corps of Engineers, Flood Insurance Study of the Town of Falmouth, Massachusetts, at 1 (prepared for FIA 1975). The Corps reexamined its own original flood insurance study, in light of two technical reports submitted by Arthur Miller, a physical oceanographer residing in Falmouth. Submission of such reports, however, is the exception rather than the rule.

106. Hunter interview, supra note 19, and Crompton telephone interview, supra note 40.

107. GAO, Formidable Administrative Problems Challenge Achieving National Flood Insurance Program Objectives 26-27 (1976).

108. 24 C.F.R. §1914.3 (1977).

109. Crompton telephone interview, supra note 40. See 24 C.F.R. Part 1920.

110. 42 U.S.C. §4104 (Supp. IV 1974). The FIA publishes the FIRM (and also the FHBM) in the Federal Register as a proposed final determination. Also, copies of the map are placed on display in the community by the local government, by the affected insurance companies in their offices, by the appropriate state water resource agency, and by the FIA in its Washington, D. C., office. 24 C.F.R. §1914.3(c) (1977).

111. 42 U.S.C. §4104(b) (Supp. IV 1974).

112. 42 U.S.C. §4104(e) (Supp. IV 1974).

113. 42 U.S.C. §4104(f) (Supp. IV 1974).

114. 24 C.F.R. §§1917.7 - 1917.9 (1977). An individual owner or community may appeal to the Administrator, but only a community may request an administrative hearing. 24 C.F.R. §1918.3 (1977).

115. Hunter interview, supra note 19.

116. Hunter interview, id.

117. 24 C.F.R. §1917.8(c) (1977).

118. 24 C.F.R. §1917.8(b) (1977).

119. 24 C.F.R. §1909.1 (1977).

120. Cedar Falls Review, supra note 42, at 11.

121. Id. at 20.

122. Newport Beach Report, supra note 41, at 6-11.

123. Id. at 11.

124. Dames and Moore, Consultants in the Environmental and Applied Earth Sciences, Addendum to Falmouth, Massachusetts Flood Insurance Study: Appeal of the Town of Falmouth from the Flood Elevation Determination, 13 (prepared for FIA 1976).

125. Hunter interview, supra note 19.

126. 24 C.F.R. §1917.8(c) (1977).

127. 24 C.F.R. §1918.3 (1977).

128. 24 C.F.R. §1918.9 (1977).

129. 24 C.F.R. §1918.11 (1977). This procedure is not specified by the statute.

130. Hunter interview, supra note 19.

131. 24 C.F.R. §§1918.12, 1918.13 (1977).

132. 42 U.S.C. §4104(f) (Supp. IV 1974).

133. Id.

134. Id. Only one administrative appeal has been challenged in court, Town of Falmouth, Massachusetts v. Hunter, 427 F. Supp. 26 (D. Mass. 1976). The court denied a preliminary injunction that would have prevented FIA from suspending the plaintiff from the flood insurance program. The plaintiff claimed that the flood elevation determinations were arbitrary and unsupported by sound data and scientific principles. The court based its decision upon findings that there would be no irreparable harm to the plaintiff, the plaintiff had failed to show a likelihood of prevailing on the merits, and FIA had met minimum due process requirements.

135. 42 U.S.C. §4104(b) (Supp. IV 1974).

136. 42 U.S.C. §4012(c) (1970).

137. 121 Cong. Rec. S 19,036 (daily ed. November 3, 1975) (remarks of Senator Garn). See also the comments of Senator Eagleton in

J. Berry, Flood Insurance Program Hit As Federal Intrusion in Town, Washington Post, April 24, 1977, at L1, col. 3. A thorough analysis of the legal implications of flood plain regulations is presented in United States Water Resources Council, Regulation of Flood Hazard Areas to Reduce Flood Losses, Vols. 1 and 2 (1972). It is beyond the scope of the present report to examine this philosophical and legal debate.

138. Krimm interview, supra note 33.

139. 24 C.F.R. §1910.3 (1977).

140. 42 U.S.C. §4102(c) (1970).

141. See 24 C.F.R. §1910.3(c)-(e) (1977).

142. The original recommendations are contained in Report on the Flood Seminar, supra note 23, at II-2, 3.

143. Telephone interview with W. Curtis Chandler, Civil Engineer with the Flood Plain Management Division of FIA (Jan. 19, 1977) (hereinafter cited as the Chandler interview).

144. Chandler interview, id., and telephone interview with Melita Rodeck, Planning Specialist with the Flood Plain Management Division of FIA (Jan. 19, 1977) (hereinafter cited as the Rodeck interview). Ms. Rodeck is a registered architect, and in 1971 had responsibility for developing the mobile home anchorage standards.

145. Hunter interview, supra note 19; Chandler interview, supra note 143; and Rodeck interview, supra note 144.

146. Chandler interview, supra note 143; Rodeck interview, supra note 144. The specific requirements appear in 24 C.F.R. §1910.3(b)(8) (1977).

147. Rodeck interview, supra note 144.

148. Chandler interview, supra note 143.

149. 5 U.S.C. §553 (1970 and Supp. IV 1974).

150. Telephone interview with Lawrence Rubenstein, Attorney-Adviser, Office of General Counsel, HUD, attached to the Administrative Law Branch (Jan. 17, 1977) (hereinafter cited as the Rubenstein interview). Mr. Rubenstein was formerly Chief of the Policy Branch in the Flood Plain Management Division of FIA and was a key participant in the drafting of the current regulations.

151. Rubenstein interview, id.

152. 24 C.F.R. §1910.2 (1977). FIA provides references and assistance to local officials seeking to formulate flood plain management criteria. A basic reference is J. Kusler and T. Lee, Regulations for Flood Plains (Planning Advisory Service, American Society of Planning Officials, Rep. No. 277 (1972)).

153. Telephone interview with Michael Rushman, Community Planner with the Flood Plain Management Division of FIA (Jan. 21, 1977).

154. See 24 C.F.R. §1910.6 (1977). This procedure is not required by statute but was devised by FIA. Discretionary review by the Administrator is also provided where a community grants a variance to an owner of property. In general, the technical justification required is greater for larger parcels of land. The Administrator may suspend a community from the insurance program if he finds a pattern of variances inconsistent with the objectives of sound flood plain management.

155. 24 C.F.R. §1910.6(b)(1) (1977).

156. 24 C.F.R. §§1910.3(c)(2), 1910.3(c)(4), 1910.6(b)(3) (1977). Floodproofing is any modification of a structure or surrounding land so as to reduce or eliminate flood damage. See 24 C.F.R. §1909.1 (1977).

157. 24 C.F.R. §1910.3(c)(4) (1977).

158. 24 C.F.R. §§1910.3(c)(3), 1910.3(c)(4) (1977).

159. Chandler interview, supra note 143.

160. Chandler interview, id.

161. 5 U.S.C. §706 (1970).

162. Bolen v. United States, No. 74-31-W (N.D.W.Va. Aug. 27, 1975). The source of this information was a telephone interview with William Cumming, Attorney-Adviser, Office of General Counsel, HUD, (January 26, 1977) (hereinafter cited as the third Cumming interview).

163. 42 U.S.C. §4331(b) (1970).

164. Hunter interview, supra note 19.

165. A study of the application of the criteria in wetlands areas is under way. This study was initiated as a result of questions raised in comments submitted to FIA by the Natural Resources Defense Council, an environmental law group. Third Cumming interview, supra note 162.

166. Interview with F. Melvin Crompton, Director of the Engineering and Hydrology Division of FIA, in Washington, D. C. (December 20, 1976) (hereinafter cited as the Crompton interview). This interview took place after the Hunter interview, supra note 19, in Mr. Crompton's office.

167. Rubenstein interview, supra note 150.

168. Crompton telephone interview, supra note 40.

169. Krimm interview, supra note 33.

170. Crompton interview, supra note 166.

171. Crompton interview, id.

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J. Robert Hunter Deputy Administrator of FIA	November 18, 1976* January 21, 1977 (telephone)
Richard Krimm Assistant Administrator, Office of Flood Insurance, FIA	December 29, 1976 (telephone)
F. Melvin Crompton Director of Engineering and Hydrology Division of FIA	November 18, 1976* November 18, 1976 January 5, 1977 (telephone) March 3, 1977 (telephone) April 21, 1977 (telephone)
H. Joseph Coughlin Special Assistant to the Assistant Administrator, Office of Flood Insurance, FIA	November 18, 1976* November 18, 1976
Nicholas Lally Director of Flood Plain Management Division, FIA	April 22, 1977 (telephone)
William Cumming Attorney-Adviser Office of General Counsel, HUD	December 20, 1976 (telephone) January 26, 1977 (telephone) March 3, 1977 (telephone)
Lawrence Rubenstein Attorney-Adviser Office of General Counsel, HUD	January 17, 1977 (telephone)
W. Curtis Chandler Civil Engineer with the Flood Plain Management Division, FIA	January 19, 1977 (telephone) January 21, 1977 (telephone)
Melita Rodeck Planning Specialist with the Flood Plain Management Division, FIA	January 19, 1977 (telephone)
Michael Rushman Community Planner with the Flood Plain Management Division, FIA	January 21, 1977 (telephone)
Dr. Frank Thomas Staff Specialist with the USWRC	January 11, 1977 March 2, 1977 (telephone)
H. Crane Miller Attorney at Law	April 26, 1977

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U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

December 1977
HUD-FIA-277